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GB 2328343 A GB 2318944 A EP 0817393 A2
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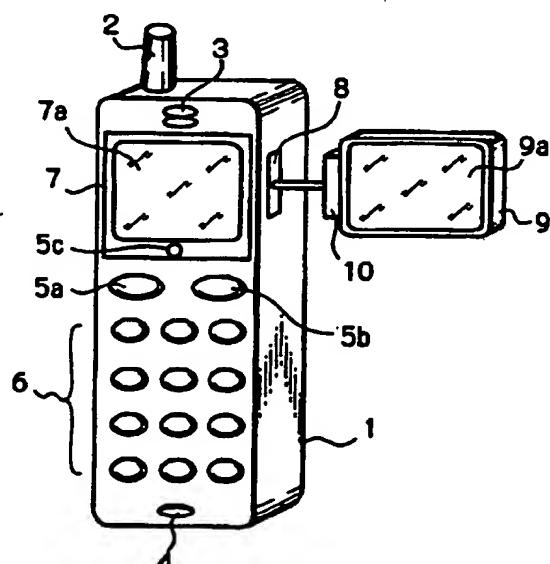
(54) Abstract Title

Radiotelephone with an auxiliary display

(57) A mobile telephone has a first, main display 7 and a second, auxiliary display 9. The auxiliary display is either removably connected to, or hinged to the main body 1 of the telephone.

The auxiliary display images contiguous with those on the main display or display overflow from the main display (figs 2a-c), or when folded in front of the main display it may display information that would otherwise be displayed on the main display (figs 3a,b).

The auxiliary display may be accommodated in the main body of the telephone (figs 4a,b).

Fig. 1

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Fig. 1

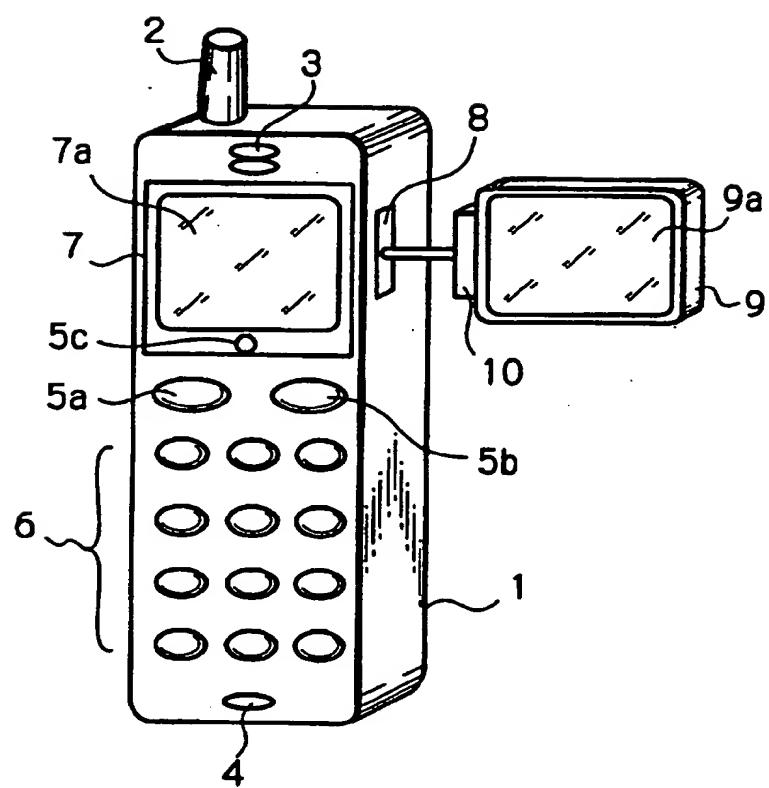


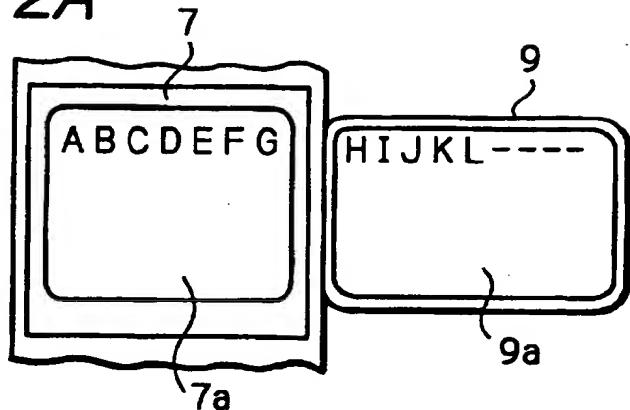
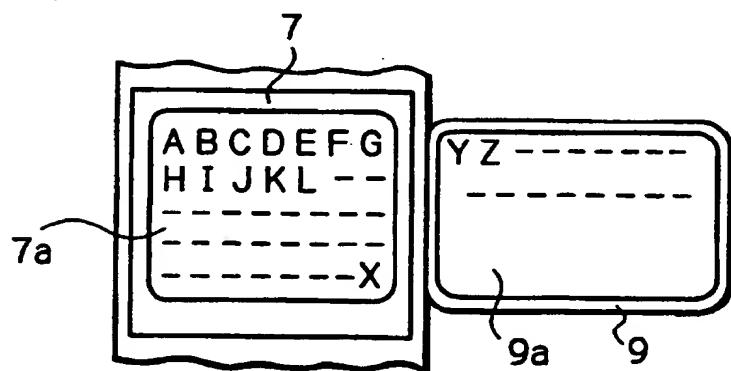
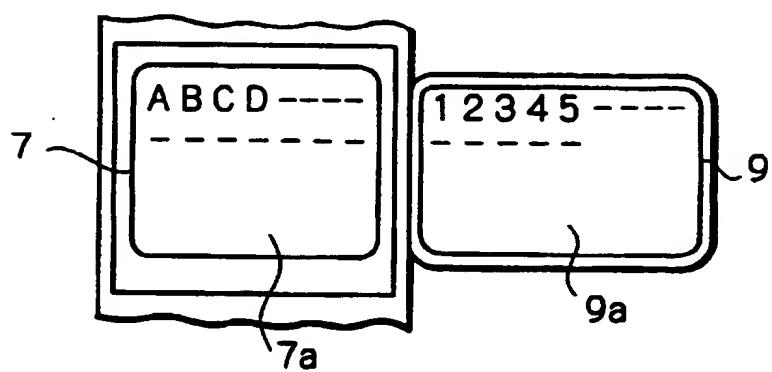
Fig. 2A*Fig. 2B**Fig. 2C*

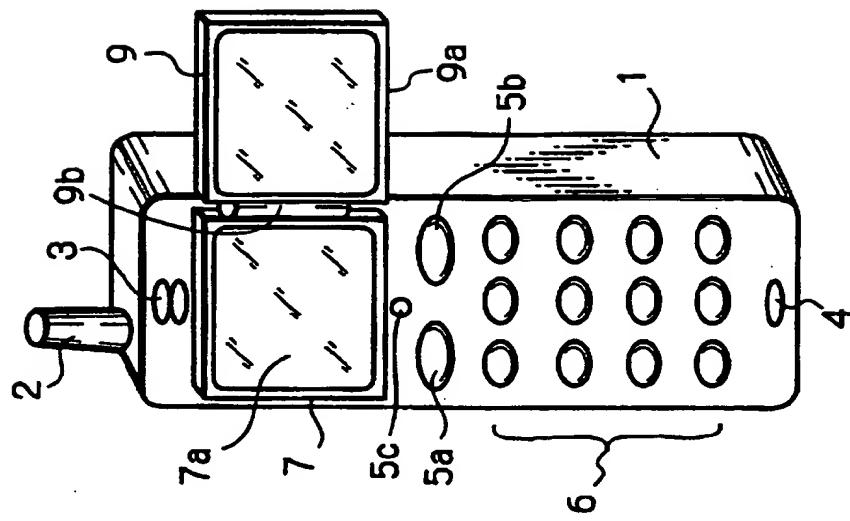
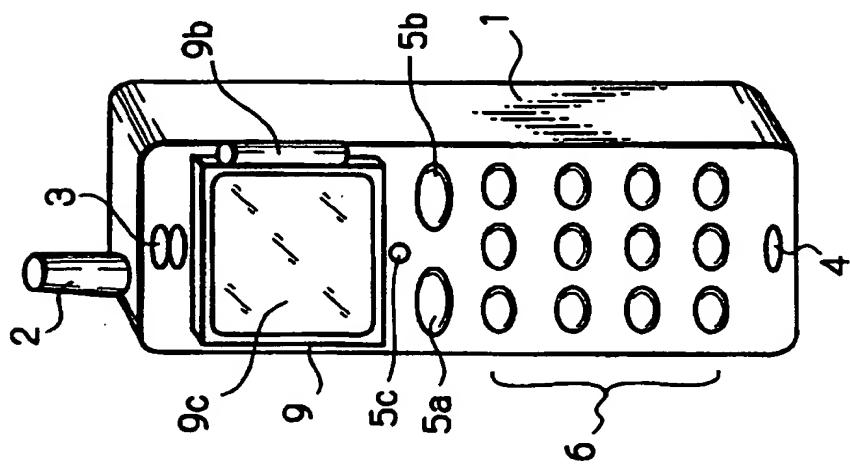
Fig. 3B*Fig. 3A*

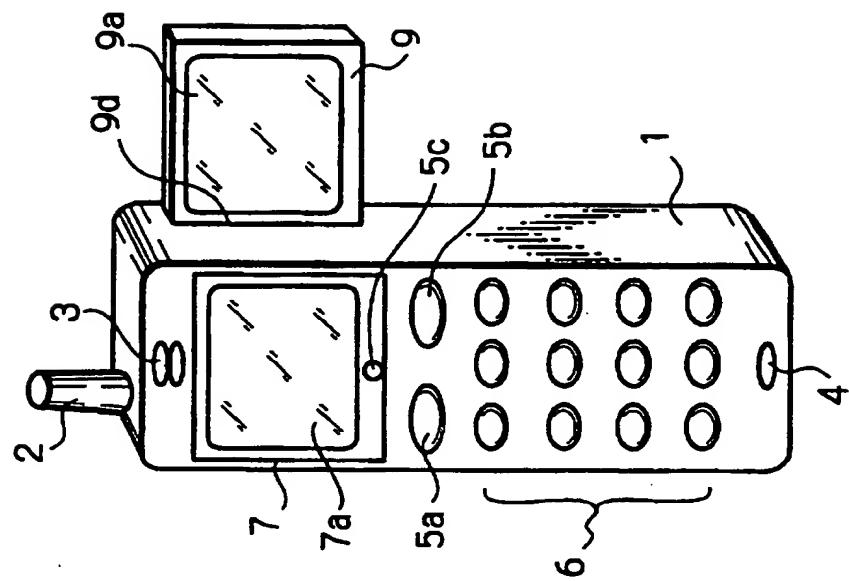
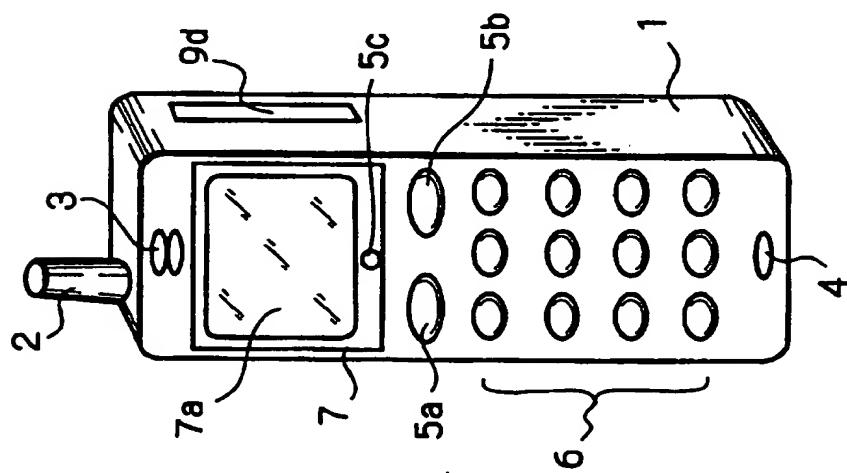
Fig. 4B*Fig. 4A*

Fig. 5

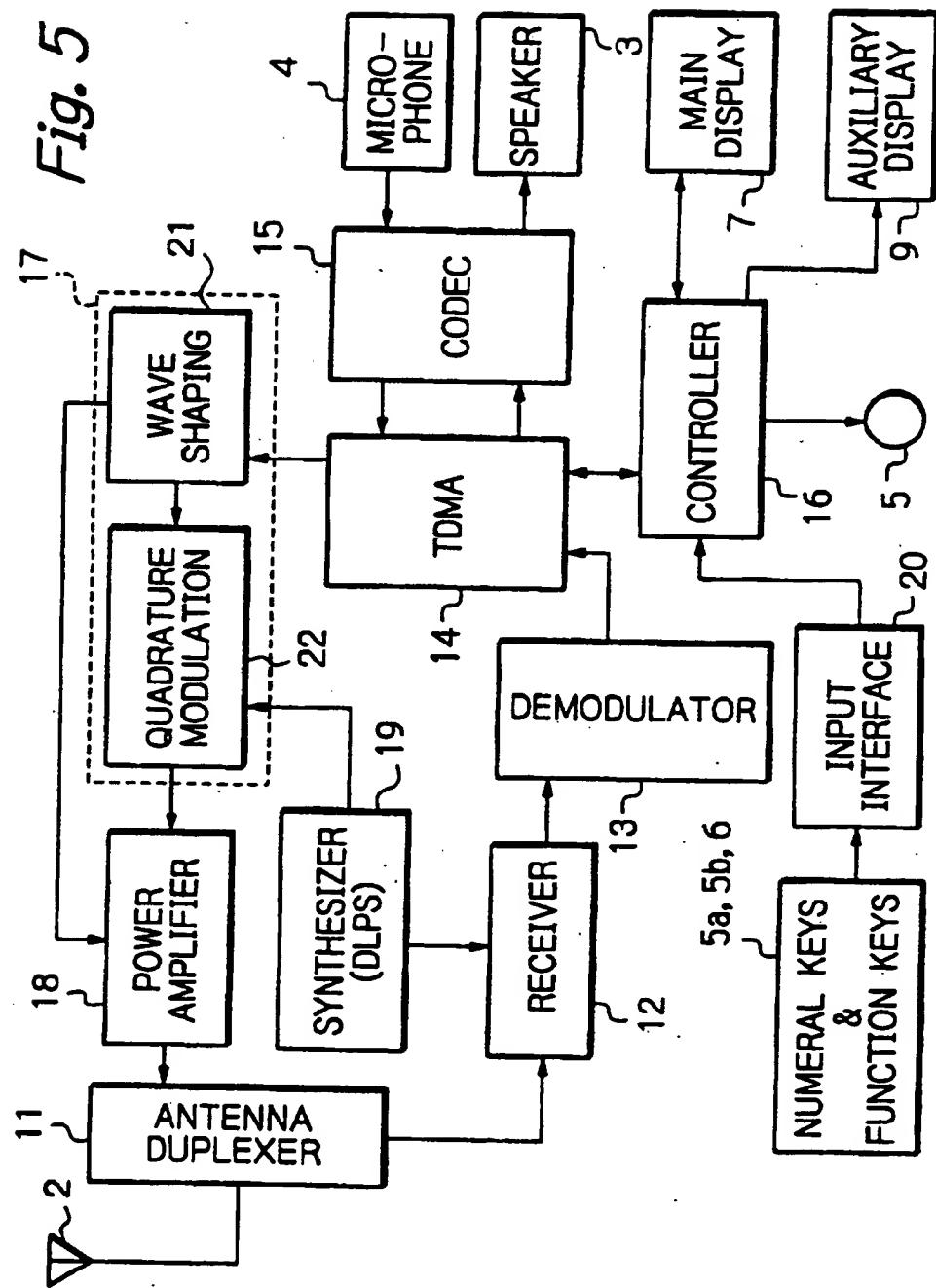


Fig. 6

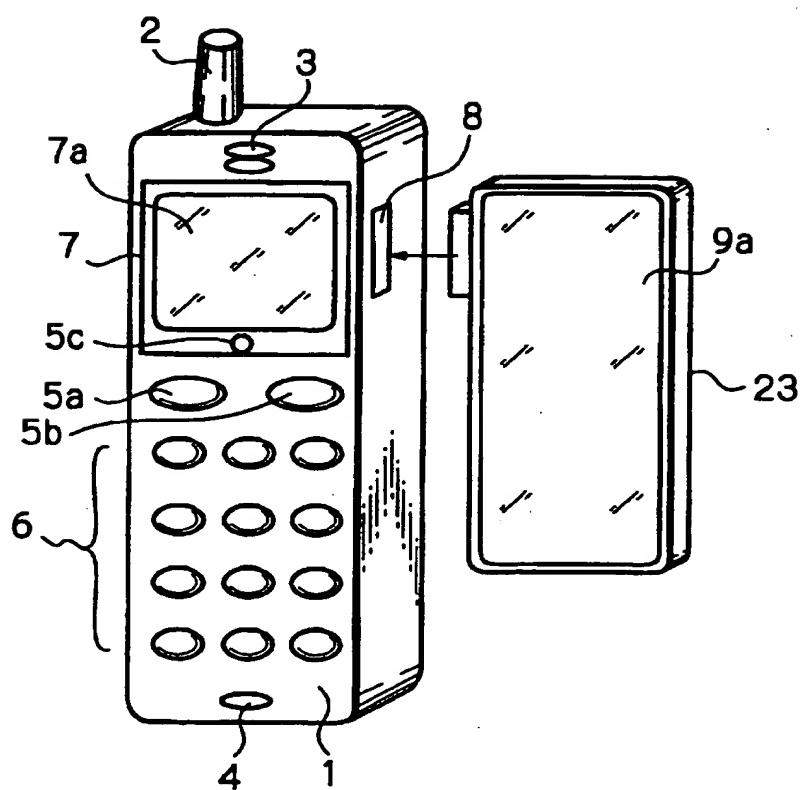


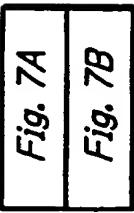
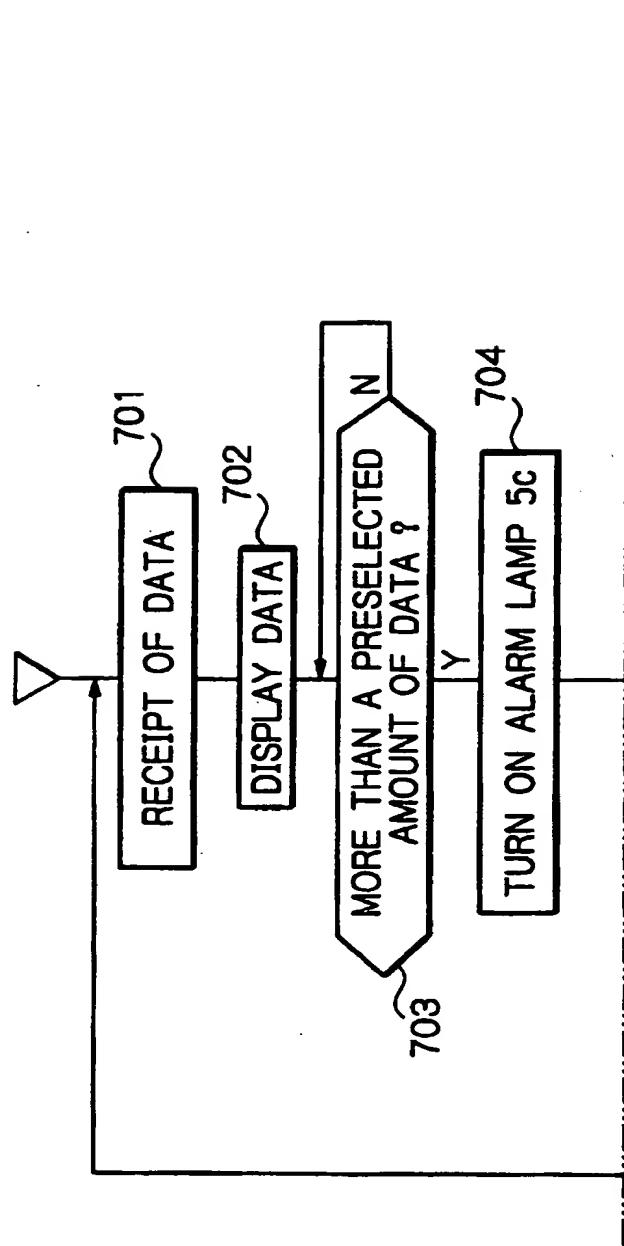
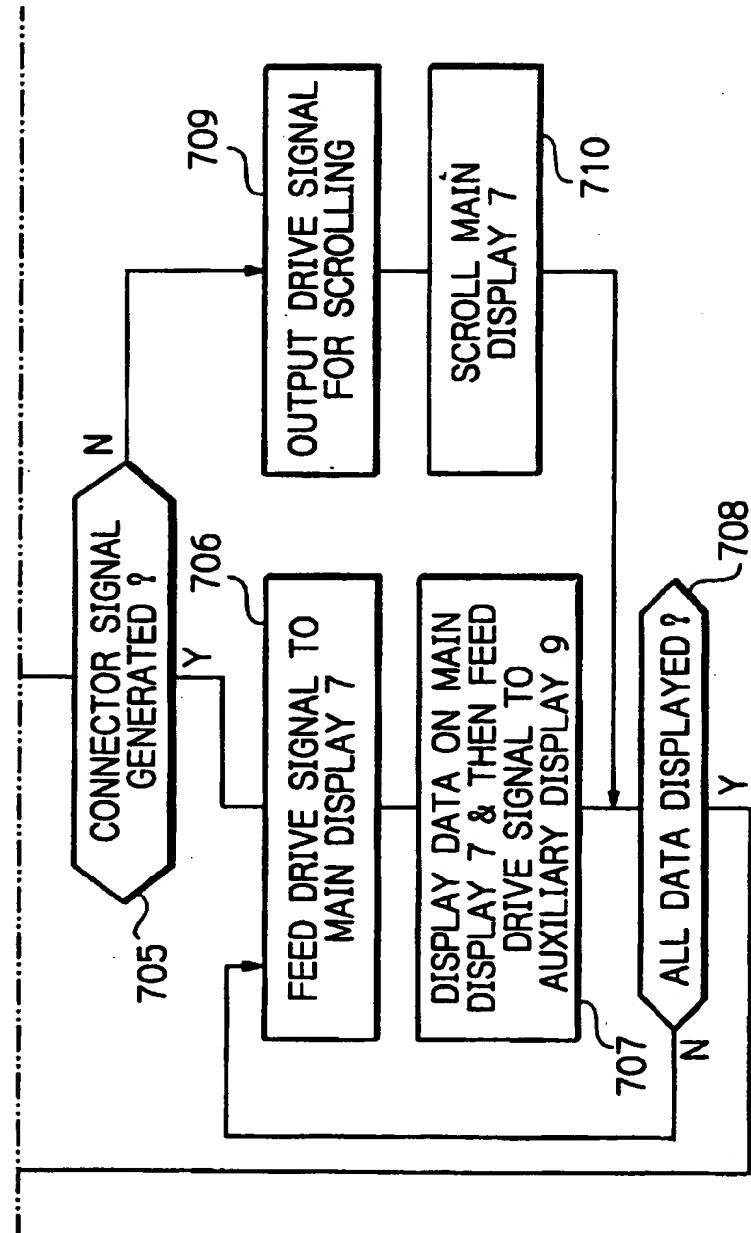
Fig. 7*Fig. 7A*

Fig. 7B

MOBILE RADIO APPARATUS

The present invention relates to a mobile radio apparatus having a display.

- A particular arrangement employing a handy phone will be described below, by way of example, in illustration of the invention. A feature of an
- 5 arrangement illustrative of the invention and to be described is that when employed with a PHS (Personal Handy phone System) or similar mobile radio apparatus the amount of data enabled to appear on its display is increased.

- A previously proposed mobile radio telephone apparatus has an LCD (Liquid Crystal Display). The display is capable of displaying the telephone
- 10 number of the radio apparatus and that of the other party, or messages, or similar text data, as distinguished from speech, at the time of connection and during conversation. Today, the amount of data required to appear on a display is increasing as a result of the addition of advanced functions to the radio apparatus.

- 15 Generally, only four lines, each including about twenty characters, are available for the data display. When the amount of data to be displayed exceeds this limit, the user of the radio apparatus scrolls the screen of the display. However, the scrolling operation is troublesome to perform.

- Moreover, the user may fail to follow the scrolling speed of the display. Whilst
- 20 the area of the display may be increased in order to obviate the scrolling operation, such a scheme would make the radio apparatus too bulky to be applicable to, e. g. a handy phone requiring a small size, light weight configuration.

- Technologies relating to the present invention are disclosed in, e.g.
- 25 Japanese Patent Laid-Open Publication Nos. 7-64 523, 8-223 332, 8-256 098

and 9-247 265.

A feature of arrangements to be described below, by way of example in illustration of the present invention is that it enables the amount of data which appears on the display of a mobile radio apparatus to be increased,

- 5 without the need to increase the size of the body of the apparatus.

A particular mobile radio apparatus to be described below, by way of example in illustration of the invention, includes a main display mounted on the apparatus body for displaying various kinds of data, and an auxiliary display connectable to or movably mounted on the apparatus body for use in

- 10 assisting the main display displaying the data.

Arrangements illustrative of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is an external perspective view of a mobile radio apparatus,

FIGS. 2A-2C are diagrammatic views each showing a particular

- 15 mode in which data is displayed on a main display and an auxiliary display of the apparatus shown in FIG. 1,

FIGS. 3A and 3B are external perspective views of alternative apparatus arrangements,

- 20 FIGS. 4A and 4B are external perspective views of yet another apparatus arrangement,

FIG. 5 is a block schematic electric circuit diagram of a mobile radio apparatus,

FIG. 6 is an external perspective view of yet another apparatus arrangement, and

- 25 FIG. 7 is a flowchart for use in describing the operation of a controller in the circuit of FIG. 5 for controlling the main display and auxiliary display.

The illustrative arrangements to be described below employ a digital

handy phone by way of example.

- Referring to FIG. 1 of the drawings, there is shown a mobile radio apparatus which includes an apparatus body 1. A transmission/reception antenna 2 protrudes from the top of the apparatus body 1. Arranged on the
- 5 apparatus body 1 are a miniature speaker or receiver 3, a microphone 4, a start button 5a for starting a connection between the radio apparatus and a remote station, an end button 5b for ending the connection, an alarm lamp 5c for urging the user of the apparatus to use an auxiliary display 9 which will be described later, and numeral keys and various function keys 6. A main
- 10 display 7 is mounted on the apparatus body 1 and includes a screen 7a implemented by an LCD. The main display 7 appears as a part of the panel surface of the apparatus body 1. A connector portion 8 is provided on one side of the apparatus body 1.

- The auxiliary display 9 mentioned above has a screen 9a on its front
- 15 that is also implemented by an LCD. A terminal portion 10 connectable to the connector portion 8 is arranged on one side of the auxiliary display 9. When the terminal portion 10 is inserted into the connector portion 8, the auxiliary display 9 is electrically connected to the apparatus body 1 and is capable of displaying data on its screen 9a, in the same manner as and at the same time
- 20 as the main display 7. The auxiliary display 9 may be removed from the apparatus body 1 and received in, e.g. the rear, or the side of the apparatus body 1 when the display 9 is not necessary or when the apparatus body 1 is being carried by the user.

- FIGS. 2A-2C each show a particular mode in which the main display
- 25 7 and auxiliary display 9 display data. In FIG. 2A, the main display 7 and auxiliary display 9 constitute a single horizontally long screen in combination; data on a single line appear on the screens 7a and 9a in the form of aligned

- segments. In FIG. 2B, data which overflows the screen 7a, is continued from the screen 7a, and appears on the screen 9a, i.e. data is displayed in two consecutive pages. In FIG. 2C, the screens 7a and 9a constitute a multidisplay displaying data different in kind or content in parallel. In this
- 5 manner, so long as the two displays 7 and 9 have the same specifications as each other, the display area available with the apparatus body 1 can be doubled without increasing the size of the apparatus body 1.
- Reference will now be made to FIGS. 3A and 3B in which there is shown an apparatus body 1 having a hinge portion 9b in the vicinity of one of
- 10 its side edges. The auxiliary display 9 may be unfolded or opened, away from the apparatus body 1 about the hinge 9b. The screen 9a and a screen 9c are also implemented by an LCD are respectively mounted on the front and the rear of the auxiliary display 9. FIG. 3A shows the auxiliary display 9 folded with its screen 9a overlying the main display 7. Even when the auxiliary
- 15 display 9 is held in its folded position, the user can see data appearing on the screen 9c, i.e. the auxiliary display 9 plays the role of the main display 7. FIG. 3B shows the auxiliary display 9 in an unfolded position; data appear on both of the screens 7a and 9a. With this configuration, this arrangement has the same advantage as the previously described arrangement.
- 20 FIGS. 4A and 4B show another arrangement in which an auxiliary display is housed within the apparatus body 1 until it is required for viewing. In this arrangement, the apparatus body 1 has a storing portion 9d for storing the auxiliary display 9 and accessible from one side of the body 1. FIG. 4A shows the auxiliary display 9 retracted into the storing portion 9d, while FIG.
- 25 4B shows it pulled out of the storing portion 9d to a preselected position where the whole screen 9a may be viewed. Connectors, not shown, are arranged in the auxiliary display 9 and apparatus body 1 such that the display

9 and apparatus body 1 are electrically connected together when the display 9 is pulled out of the storing position to the above position. In the position shown in FIG. 4B, both the main display 7 and auxiliary display 9 are visible, enabling a large amount of data to be displayed by the combined displays.

- 5 FIG. 5 shows an antenna duplexer 11 connected to the antenna 2. A receiver 12 is connected to the antenna duplexer 11 for carrying out amplification and other processing steps upon a received signal. A demodulator 13 demodulates a signal output from the receiver 12. A TDMA (Time Division Multiple Access) circuit 14 is connected to the demodulator 13.
- 10 A CODEC (Coder/Decoder) circuit 15 is connected to the TDMA circuit 14 for coding a received speech signal or decoding a speech signal to be sent. A controller 16 includes a CPU (Central Processing Unit) and semiconductor memories, although they are not shown specifically. A QPSK (Quadrature Phase Shift Keying) modulator 17 is connected to the TDMA circuit 14 and
- 15 uses a $\pi/4$ QPSK demodulation scheme in the particular arrangement being described. A power amplifier 18 is connected to the antenna duplexer 11 and the GPSK modulator 17. A synthesizer 19 switches over the transmission side and the reception side of the circuitry to each other at high speed. The synthesizer 19 is a DLPS (Digital Loop Preset Synthesizer). The speaker 3
- 20 and the microphone 4 are connected to the CODEC circuit 15. An LED (Light Emitting Diode) or lamp 5 and the main display 7 and the auxiliary display 9 are connected to the controller 16.

- The numeral keys 6 are connected to an input interface 20 that is, in turn, connected to the controller 16. The QPSK modulator 17 includes a wave shaping circuit 21 and a quadrature modulator 22. The wave shaping circuit 21 shapes the waveform of a signal output from the TDMA circuit 14 while the quadrature modulator 22 modulates the output of the wave shaping 21 in
- 25

accordance with the $\pi/4$ QPSK modulation scheme.

The operation of the circuitry shown in FIG. 5 will now be described.

To originate a call, the user of the apparatus inputs the phone number of a desired destination by means of the numeral keys 6 or by using a number

- 5 stored in the memory of the controller 16. The phone number input or called appears either on the main display 7 or the auxiliary display 9. Subsequently, the user presses the start button 5a positioned on the panel surface of the apparatus body 1. In response, the controller 16 activates the transmission system including the TDMA circuit 14, the QPSK modulator 17, the power
- 10 amplifier 18 and the antenna duplexer 11, and thereby starts the transmission of the telephone number (tone signal). At this instant, the synthesizer 19 switches over the transmission side and the reception side at a preselected timing so as to allow the apparatus to receive a response from the destination via a base station and to send its own signal. After a connection has been set
- 15 up between the apparatus and the destination, a signal received via the antenna 2 is routed through the antenna duplexer 11, the receiver 12, the demodulator 13, the TDMA circuit 14 and the CODEC 15 to the speaker 3. A user's speech input to the microphone 4 is delivered to the antenna 2 via the CODEC 15, the TDMA circuit 14, the QPSK modulator 17, the power amplifier
- 20 18 and the antenna duplexer 11 and radiated into space.

When the apparatus receives a call, a connection signal received via the antenna 2 is routed through the antenna duplexer 11, receiver 12, the demodulator 13, TDMA circuit 14 and the controller 16 to the main display 7 (or the auxiliary display 9). As a result, the phone number of the calling station

- 25 is displayed on either the main display 7 or the auxiliary display 9. Speech from the calling station is decoded by the CODEC circuit 15 to provide a speech signal. The speaker 3 provides electric-to-acoustic conversion, with a

speech signal being output from the CODEC circuit 15.

- The controller 16 provides a control relating to the connection of the auxiliary display 9 to the apparatus body 1 shown in FIG. 1, or FIGS. 4A and 4B, or to the positions of the display 9 shown in FIGS. 3A and 3B. As for the 5 specific display modes shown in FIGS. 2A-2C, the controller 16 either allows the user to select a desired one of them by means of the numeral or function keys 6, or selects automatically one of them in accordance with a preselected program. For example, assume that the controller 16 determines that the amount of data to be displayed is large, and that the auxiliary display 9 should 10 preferably be used together with the main display 7. Then, the controller 16 turns on the alarm lamp 5c, in order to urge the user to mount the auxiliary display 9 to the apparatus body 1, or set it in a preselected position.

- Mobile communication is attracting increasing attention in the portable telephone and PHS art. Assume that the user of the above radio 15 communication apparatus outside of, e.g. a company receives data from the company or sends data to the company or receives data via the Internet. Then, considering the large amount of data, the controller 16 urges the user to use both the main display 7 and the auxiliary display 9, and, if necessary, turns on the alarm lamp 5c. The capacity of the auxiliary display 9 of any one 20 of the above embodiments may be too small to cope with the above situation. In the light of this, as shown in FIG. 6, use may be made of an auxiliary display 23 having an area several times as great as the area of the auxiliary display 9, or even substantially identical with the area of the apparatus body 1 and removably mounted to the apparatus body. The crux is that the display 25 size be variable in accordance with the amount of data dealt with, as desired.

A specific operation of the controller 16 for controlling the main display 7 and the auxiliary display 9 will now be described with reference to

- FIG. 7. As shown, when text data or similar data to be displayed are received (step 701), the controller 16 causes the main display 7 to display the data (step 702). Assume that the amount of received data is greater than a preselected amount corresponding to the capacity of the main display 7 (Y).
- 5 step 703). Then, the controller 16 turns on the alarm lamp 5c (step 704). Subsequently, the controller 16 determines whether or not a signal representative of the connection of the auxiliary display 9 to the apparatus body 1 (a connection signal) is generated in the main display 7 (step 705). If the answer from the step 705 is positive (Y), the controller 16 first delivers a
10 drive signal to the main display 7, causing it to start displaying the data (step 706).

As soon as the main display 7 overflows, the controller 16 drives the auxiliary display 9 connected to the apparatus body 1, causing it to start displaying the rest of the data (step 707). Subsequently, the controller 16
15 determines whether or not the data have been fully displayed on the two displays 7 and 9 (step 708). If the answer of the step 708 is Y, the controller 16 returns to the step 701. If the answer of the step 708 is negative (N), the controller 16 repeats the steps 706, 701 and 708 until the data have been fully displayed on the displays 7 and 9. Assume that the auxiliary display 9 is not
20 connected to the apparatus body (N, step 705), i.e. only the main display 7 is available. Then, the controller 16 scrolls the screen 7a of the main display 7, i.e., returns to the first line every the last line is displayed (steps 709 and 710).

As stated above, the controller 16 automatically selects a display mode on the basis of whether or not the auxiliary display 9 is connected to the
25 apparatus body 1. This allows received data to be displayed in the optimal manner.

In summary, it will be understood that there has been described a

mobile radio apparatus including an auxiliary display, in addition to a main display which is mounted on the apparatus body. The radio apparatus can therefore display a far larger amount of data than is possible with previously proposed apparatuses at the time of, e.g. transmission or reception. This

- 5 reduces the need for the user of the radio apparatus to repeat a scrolling operation.

Further, because the auxiliary display is retracted into or folded on to the apparatus body when it is not needed, the apparatus body is comparatively small and easy to carry, in spite of the increased display

10 capacity. In addition, the main display and auxiliary display may be positioned in the same plane as each other and thus allow the user easily to see the data.

It will be understood that, although particular arrangements have been described, by way of example in illustration of the invention, variations

15 and modifications thereof, as well as other arrangements may be conceived within the scope of the appended claims. For example, while the illustrative arrangements have concentrated on a handy phone, the present invention is, of course, applicable to PHS, or even to any other kind of portable mobile radio apparatus.

- 20 It will be understood that the auxiliary display may have a raster contiguous with that of the main display.

CLAIMS

1. A mobile radio apparatus including an apparatus body, a main display on the apparatus body for displaying data, and an auxiliary display connectable to, or movably mounted with respect to, the apparatus body for the display of further data

2. A mobile radio apparatus as claimed in claim 1, wherein the auxiliary display includes a terminal portion connectable to a connector portion included in the apparatus body.

10

3. A mobile radio apparatus as claimed in claim 1, wherein the auxiliary display is hinged to the apparatus body for movement away from the apparatus body.

15

4. A mobile radio apparatus as claimed in claim 1, wherein the auxiliary display has a first and a second screen on a front and a rear thereof, respectively, the second screen displaying, when the auxiliary display is positioned over the main display, data which would otherwise appear on the main display.

20

5. A mobile radio apparatus as claimed in claim 1, wherein the apparatus body has a storing section at one side for accommodating the auxiliary display, the auxiliary display being electrically connected to the apparatus body when out of the storing section.

25

6. A mobile radio apparatus as claimed in claim 1, wherein the auxiliary display is provided by a raster contiguous with a raster of the main display.

7. A mobile radio apparatus as claimed in claim 1, wherein when a screen of the main display overflows, the auxiliary display displays the overflow data.

- 5 8. A mobile radio apparatus as claimed in claim 1, wherein the auxiliary display displays data different from the data displayed on the main display.
9. A mobile radio apparatus as claimed in claim 1 including an arrangement substantially as described herein with reference to any one of
- 10 the accompanying drawings.



Application No: GB 9912624.5
Claims searched: 1 to 8

Examiner: Peter Easterfield
Date of search: 10 August 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4J (JK); H4L (LECX)

Int Cl (Ed.6): H04B 1/38; H04M 1/02

Other: Online: WPI, EPDOC, JAPIO

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| X, P | GB 2328343 A (NEC) see figs 5-7 | 1,3,8 |
| X | GB 2318944 A (LUCENT) see figs 1 & 3-11 | 1,3,8 |
| X | EP 0817393 A2 (MOTOROLA) see figs 3-16 | 1-3,8 |
| X | EP 0539699 A2 (MOTOROLA) see fig 1A | 1,8 |
| X | WO 96/35288 A1 (SIEMENS) see fig 3 | 1,3,8 |
| X | WO 98/19435 A1 (KOPIN) see figs 9a-j, 10a, 11, 12a-b, 13a-x | 1-3,5,8 |

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